EFFECTS OF FLUTTER DEVICE WITH CONVENTIONAL PHYSIOTHERAPY AND CONVENTIONAL PHYSIOTHERAPY ALONE ON PULMONARY FUNCTION IN PATIENTS WHO UNDERWENT UPPER ABDOMINAL SURGERY

- A COMPARATIVE STUDY

Dissertation submitted to The Tamilnadu Dr. M.G.R. Medical University towards partial fulfillment of the requirements of MASTER OF PHYSIOTHERAPY (Advanced PT in Cardio-pulmonary diseases) Degree Programme.

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CERTIFICATE

CERTIFICATE

This is to certify that research work entitled **"EFFECTS OF FLUTTER DEVICE WITH CONVENTIONAL PHYSIOTHERAPY AND CONVENTIONAL PHYSIOTHERAPY ALONE ON PULMONARY FUNCTION IN PATIENTS WHO UNDERWENT UPPER ABDOMINAL SURGERY" - A Comparative study** was carried out by the candidate bearing the Register No: 27101615, KMCH College of Physiotherapy towards partial fulfillment of the requirements of the **Master of Physiotherapy (Advanced PT in Cardio-pulmonary diseases)** of The Tamil Nadu Dr. M.G.R. Medical University, Chennai-32.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

Project Evaluated on:

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ABSTRACT

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Aim: To study the effect of flutter on pulmonary function in patients who underwent upper abdominal surgery.

Objective: To compare the effect of flutter device with conventional physiotherapy and conventional physiotherapy alone in patients who underwent upper abdominal surgery.

Study design: Pre-test, post-test comparative study design.

Methodology: 30 patients who underwent upper abdominal surgery were selected through simple random sampling for the study and assigned into two separate groups. Group A consisting

15 patients were treated with flutter along with conventional therapy whereas Group B consisting of 15 patients were treated with conventional Physiotherapy alone.

Outcome measures: Pre-test, post-test measurements are taken on 2^{nd} and 5^{th} post-operative day using a computerized pulmonary function test. The values of respiratory rate (RR), forced expiratory volume in first second (FEV1) and maximum voluntary ventilation (MVV) were taken.

Result: The data were analyzed using paired‘t’ test and independent‘t’ test. With paired‘t’ test there is a significant difference in RR, FEV1 and MVV values within the pre test and post test values of both the groups. In independent‘t’ test the analysis at 5% level of significance denotes that there is a significant difference in RR, FEV1 and MVV between the groups. Group A showed significant improvement than the Group B.

Conclusion: From the results it can be concluded that flutter has immediate effect on removal of secretions thereby maintaining pulmonary functions.

KEY WORDS: PEP- Positive Expiratory Pressure.FEV1- Forced Expiratory Volume in First Second. MVV- Maximum Voluntary Ventilation. RR- Respiratory Rate.PFT-Pulmonary Function Test.

INTRODUCTION

1. INTRODUCTION

The medical field is expanding and excelling very rapidly. This expansion ensures that medical procedures are more safe and with nil or minimal complications. Abdominal surgeries are no exception. However, the rate of post operative pulmonary complications remains stable because of high risk patients, consequence of co-morbidity conditions and due to the effect of anesthesia.

Anesthesia is said to have a profound effect on the respiratory system by decreasing mucociliary escalator action and depression of cough reflex. This leads to accumulation of secretions which in turn causes infections. Thus, removal of secretions is paramount.

Removal of secretions can be effectively carried out by using cardiopulmonary physical therapy interventions. These interventions include Postural Drainage, Forced Expiratory Technique, Intermittent Positive Pressure Breathing and Chest Percussion Technique.

The aims of the techniques and interventions are to limit bacterial burden, decrease inflammation in conducting airways and enhance clearance of airway secretions.

Airway secretions can be mobilized using a device known as flutter. Flutter is an oscillating positive expiratory pressure device that combines the resistive features and vibratory features of positive expiratory pressure. This immediately increases endobronchial pressure and accelerates expiratory flow. The added advantage of this device is its requirement of less therapist's supervision, its utilization in patient unable to tolerate chest physiotherapy and postural drainage. This small hand-held device acts as an adjunct to bronchial hygiene. The average amount of sputum expectorated by using this device was four times greater when compared to other conventional therapies.

Conventional chest physiotherapy requires positional changes to drain the secretions from smaller airways. This makes clearance of chest secretions in acute post operative patients difficult since such patients may not tolerate position changes due to pain and discomfort.

Flutter device helps to overcome this problem in post operative patients as it involves minimal position change and ensures maximum comfort for the patients and may give optimal results.

1.1 NEED FOR THE STUDY

Postoperative pulmonary complication after abdominal surgery is purported to 10 % to 80%. Decreased lung volumes and atelectasis due to surgery are related with shallow breathing, bed rest, diaphragmatic dysfunction, pain and impaired mucociliary clearance.

Secretions removal plays an important role in physiotherapy management of patients who underwent upper abdominal surgery.

There are very few studies done by using flutter devices in post operative patient who underwent upper abdominal surgeries. Thus, there is a need for the study.

Studies have shown that flutter was more effective than other techniques. But, most of these studies have been done among subjects with Cystic fibrosis, COPD, etc.

This study aims to highlight the effects of flutter device in airway clearance among post abdomen surgery patients in India.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

2.1 INCIDENCE

- **Shahnaz Afroza et al.,** have concluded that in upper abdominal and thoracic surgery, the postoperative pulmonary complications ranged from 10 % to 40 %.

2.2PULOMONARY COMPLICATIONS FOLLOWING ABDOMINAL SURGERIES

- **Pasteur et al.,** have mentioned that the reduction of lung functions in post operative surgery patients leads to ineffective cough and poor mucociliary actions[19].
- **Brooks brunn JA et al.,** have concluded that the patients have more chance for pulmonary complications after abdominal surgery if they have positive smoking, BMI = 27, history of cancer, etc[8].
- **Rovida S et al.,** have mentioned that the presence of mucous hyper secretions with an increase in residual volume and to a lesser extent low values of both FEV1 and TLCOsb best predicts the severe post operative respiratory complications[10].
- **Fernandes et al.,** have concluded that chronic pulmonary disease, co-morbidity and surgery lasting more than 210 minutes are three major clinical risk factors for development of pulmonary complications following upper abdominal surgery. He also found that FEV1/FVC lower than 70% predicts the post-operative pulmonary complications following upper abdominal surgery.
- **Siafakas N M et al.,** have concluded that the functions of the respiratory muscles were affected by the variety of surgical procedures[35].
- **Flogilani J et al.,** have pointed out that even those patients who underwent abdominal surgeries and had no past history of respiratory disorders before surgery developed post operative pulmonary complications[19].
- **Overend et al.,** have found out that the pulmonary complications in abdominal and thoracic surgeries developed within 24 hours. This was due to reduced mucociliary escalation.

- **Siafakas N M et al.,** have done a systematic review and concluded that, after upper abdominal surgery there was decrease in maximum inspiratory pressure, transdiaphramatic pressure, maximum expiratory pressure which sustains for 48 hours after surgery and persists for a week, gradually returning to normal[35].
- **Georgy et al.,** have accepted that sputum retention leads to airway plugging, increased exacerbation, lung damage, increased hospital stays, and reduced lung function. So, promoting sputum clearance was an essential part of pulmonary rehabilitation[28].
- **Dean Hess et al.,** have evaluated that secretion clearance was necessary to prevent post operative complications as it causes an increased hospital stay[22].
- **Metana et al.,** have concluded that there was high chance for morbidity and mortality due to pulmonary complications related to surgery and anesthesia.

2.3 FLUTTER AND MUCOUS CLEARANCE

Flutter is a device that uses oscillating positive expiratory pressure that varies from 10 to 20 cm H_2O. The device creates a self regulated oscillating positive pressure, due to a steel ball, with oscillation of the airflow.

- **Gonder et al., have** concluded that patients using the flutter devices had better pulmonary function after a week of therapy.
- **Lindemann H et al.,** have compared autogenic drainage with the flutter and found that both regimens were equally effective but flutter was easier to teach[25].
- **Sugimoto Y et al.,** have mentioned that the use of flutter was effective in clearing mucous secretions from airway.
- **Ambrosino et al.,** have stated that flutter was effective as a conventional physiotherapy.
- **Mcllwaine PM et al., have** found that Exhalation through the Flutter vibrates the airway walls, decrease the collapsibility of the airways in the lungs and accelerate airflow facilitating movement of mucus up the airways and improving lung function and oxygenation[29].
- **Linderman B et al.,** have compared flutter with Autogenic drainage and concluded that both were effective in maintaining bronchial hygiene.

- **Pryor et al.,** have suggested that flutter was less effective than Active cycle of breathing[34].
- **Nakamura et al.,** have found out that the use of flutter could increase the expectoration of sputum and can relieve related symptoms.
- **Wolkove et al.** have compared and found that chest physiotherapy and flutter were equally effective when used as bronchial hygiene therapy for promotion of sputum mobilization and in improving breath sounds.
- **Sharon M H et al.,** have conducted a pilot study which was comparing the effects of postural drainage or flutter device in conjunction with breathing and coughing, with breathing and coughing alone in improving secretion removal and lung function in patients with acute exacerbation of Bronchiectasis. They suggested that there was no difference in sputum production or lung function parameters among the three groups.
- **Andrea bellone et al.,** have done a prospective randomized study on three forms of chest physiotherapy including postural drainage, flutter and ELTGOL. They concluded that all three treatments were effective in patients with acute exacerbation of chronic bronchitis[6].
- **Orman et al.,** have done a systematic study by evaluating six randomized control trials. They concluded that PEP technique with the help of mechanical device was needed for the patients after abdominal and thoracic surgery to prevent or reduce post operative complications[32].
- .**Weiner P et al,.** have concluded that long term home physiotherapy with the flutter was effective in COPD in promoting airflow, ability and symptoms.

- **E Westerdahl et al.,** have concluded that the PEP technique was the treatment of choice post operatively to increase pulmonary volumes, decrease atelectasis and promote secretion removal.
- **Ng and Jones et al.,** have concluded that vital capacity measured in ten post-surgical patients with a high abdominal incision improved significantly after fifteen minutes session of flutter VRP1.
- **Gondor et al., Langenderfer B et al., Mcllwaine PM et al.,** have concluded that the devices of respiratory physiotherapy are introduced as alternative therapy methods to facilitate and improve mobilization of mucus from airways, through which better lung

ventilation and improved pulmonary function can be achieved. The device was safe and offered acceptable airway clearance to conventional chest physiotherapy.

- **Brooke et al.,** have demonstrated that there was positive incline and a large airflow response in an increase in expiratory procedure with flutter.
- **Oberwaldner B et al.,** have concluded that PEP stabilized the airways by splinting them open during expiration so facilitating sputum clearance[31].

2.4 DIAPHRAGMATIC BREATHING EXERCISE

- **Pryor et al.,** have reported that breath control was normal in tidal breathing using lower chest with relaxation of upper chest and shoulder[33].
- **Lawrence V A et al.,** have done a systematic study on lung expansion therapy such as incentive spirometry, deep breathing exercise and CPAP. They concluded that it reduced the post operative pulmonary complications after abdominal surgery[4].
- **Carolyn kisner et al.,** have suggested that deep breathing exercise was designed to improve the efficacy of ventilation, reduce the work of breathing and improve gas exchange and oxygenation.
- **Anderson J M et al.,** have suggested that breathing exercise was useful for assisting in the removal of secretions and improving movements of the thoracic cage[4].
- **Sanya AO et al.,** have conducted a study and determined that breathing exercise training increases the vital capacity and peak expiratory flow rate of abdominal surgery patients.
- **Lawrence et al**., have mentioned that lung expansion interventions such as Incentive spirometry, chest physical therapy, deep breathing exercises and postural drainage were helpful for patients who underwent abdominal and thoracic surgery[39].

2.5 INCENTIVE SPIROMETER

- **Barlett et al.,** have reported that incentive spirometry was activated by inspiratory effort. Breathing uplifted plate or ball in a transparent cylinder during sustained inspiration.

- **Clague M B et al.,** have suggested that prediction of post operative pulmonary complications could be done by simple incentive spirometry[5].
- **Crapo et al.,** have concluded that pulmonary function test was done by simple spirometry. Spirometry was performed prior to and immediately after use of flutter[14].
- **Ros A M et al.,** have conducted a study in incentive spirometry and in prevention of post operative pulmonary complications after abdominal surgery. They concluded that incentive spirometry was easy and an efficient method to prevent atelectasis[36].
- **Thomas J A et al.,** have proved the efficacy of IPPB, incentive spirometry and diaphragmatic breathing exercise in the prevention of post operative pulmonary complications[42].

2.6 PULMONARY FUNCTION TESTS

- **Shahnaz Afrozal et al., S** have done a randomized control trial with pulmonary function tests as a measuring tool to measure pulmonary function thereby evaluate effectiveness of chest physical therapy during immediate post operative period among patients undergoing elective upper abdomen surgery.
- **Shawn D. Aaron et al.,** have concluded that spirometry was very useful in excluding a restrictive defect. When the VC was within the normal range, the probability of a restrictive defect was < 3%, and unless restrictive lung disease was suspected a priori, measurement of lung volumes can be avoided. However, spirometry was not able to accurately predict lung restriction; < 60% of patients with a classical spirometry restrictive pattern had pulmonary restriction confirmed on lung volume measurements. For these patients, measurement of the TLC was needed to confirm a true restrictive defect[40].

AIMS & OBJECTIVES

3. AIM AND OBJECTIVES

3.1 AIM OF THE STUDY

To study the effect of flutter device with conventional physiotherapy and conventional physiotherapy alone on patients who underwent upper abdominal surgery.

3.2 OBJECTIVES

1. To find out the effect of flutter with conventional physiotherapy on pulmonary functions in patients who underwent upper abdominal surgery.
2. To find out the effect of conventional physiotherapy on pulmonary functions in patients who underwent upper abdominal surgery.
3. To compare the flutter device with conventional physiotherapy and conventional physiotherapy alone in patients who underwent upper abdominal surgery.

MATERIALS & METHODOLOGY

4. MATERIALS AND METHODOLOGY

4.1 STUDY DESIGN

Pre test and post test experimental design.

4.2 SAMPLING TECHNIQUE

Simple random sampling.

4.3 STUDY POPULATION

30 subjects who underwent upper abdominal surgery.

4.4 STUDY SETTING

Kovai Medical Center and Hospital, Coimbatore.

4.5 TREATMENT DURATION

4 days.

4.6 INCLUSION CRITERIA

- FEV1: 50% to 80% predicted.
- Age: 40 to 60 years.
- Sex: male and females.
- Patients who underwent upper abdominal surgery.

4.7 EXCLUSION CRITERIA

- Patients with restrictive lung diseases.
- Cystic fibrosis.
- Asthma.
- Rib fracture.
- Un-cooperative patients.
- Cardiac diseases like cardiac failure, myocardial infarction.

- Neurological deficits.
- Pneumothorax.

4.8 NULL HYPOTHESIS

- **H_{01}** There is no significant effect of conventional physiotherapy on pulmonary functions in patients who underwent upper abdominal surgery.
- **H_{02}** There is no significant effect of conventional physiotherapy along with flutter on pulmonary functions in patients who underwent upper abdominal surgery.
- **H_{03}** There is no significant difference between conventional physiotherapy and conventional physiotherapy along with flutter on pulmonary functions in patients who underwent upper abdominal surgery.

4.9 ALTERNATE HYPOTHESIS

- **H_{A1}** There is a significant effect of conventional physiotherapy on pulmonary functions in patients who underwent upper abdominal surgery.
- **H_{A2}** There is a significant effect of conventional physiotherapy along with flutter on pulmonary functions in patients who underwent upper abdominal surgery.
- **H_{A3}** There is a significant difference between conventional physiotherapy and conventional physiotherapy along with flutter on pulmonary functions in patients who underwent upper abdominal surgery.

4.10 STUDY METHOD

- 30 patients were selected based on inclusion criteria. And they were randomly assigned to control group and experimental group each group containing 15 subjects.

- Pre-test assessment is taken on the second post operative day and post test is taken on the fifth post operative day.

4.11 PROCEDURE

- ✓ **GROUP: A** (Conventional physiotherapy along with flutter).

- ➢ **FLUTTER**
    - The patient is asked to sit in a comfortable upright sitting position with the elbow supported on the table and neck is slightly extended in order to open up the airway.
    - In order to get a maximum oscillatory effort the flutter is used by placing it horizontally in the mouth and tilted slightly upwards.
    - Inspiration is done through the nose, a slow breath which is slightly deeper than the normal with a breath hold for 3-5 seconds is followed by breath out through the flutter device in slightly faster rate than normal.
    - After 4 to 8 of these breaths with a hold at full inspiration it is followed by a forced expiration through the flutter device.
    - This precipitates expectoration and is followed by a pause for breathing control and then according to the subject's preference a cough or huff is done.
    - The upward movements of the flutter increase the pressure and frequency while movements of devices downward results in lower pressure and frequency.
    - While doing the procedure the patient should keep the cheeks flat and use the abdominal muscles to produce effective exhalation.
    - The vibration of chest is palpated by the patient to provide feedback.
    - To avoid dizziness due to hyperventilation a patient should refrain from forced exhalation. It may be necessary to have a pause every 5-10 exhalation before resuming the session.
    - Treatment duration: 10 to 15 minutes.

✓ **GROUP B: (**Conventional physiotherapy).

➢ DIAPHRAGMATIC BREATHING EXERCISE

The technique for diaphragmatic breathing exercise is as follows:

- The patient should be in a relaxed and comfortable position.
- Therapist hand is placed on Rectus Abdominal muscle just below the anterior costal margin.
- The patient is asked to breathe in slowly and deeply through the nose with relaxed shoulder and patient is asked to hold for 3-5 seconds.
- The patient is asked to place his or her own hand below the anterior costal margin and asked to feel the movements.
- The patient is advised to raise hand during inspiration and bring it down during expiration.
- Session: 3 session /day.
- Repeition: 10 repetition /session.

➢ INCENTIVE SPIROMETRY

- The patient is asked to sit on the edge of the bed and asked to hold the Incentive spirometer in an upright position.
- Place the mouth piece in the mouth and seal in lips tightly around it. Ask the patient to breath slowly and deeply and hold the breath as possible.
- Sessions: once in every three hour.
- Repetition: 10 repetitions /session.
- Rest at the end of 5 repetitions.

➢ SPLINTED COUGHING

- The patient should be in a relaxed and comfortable position and take a deep breath, hold for 3 seconds and cough deeply 2 or 3 times with reinforcing the incision area with folded bed sheet.

4.12 OUTCOME MEASURE AND MEASUREMENT TOOLS

Computerized pulmonary function test is used to find the,

- FEV1- Forced Expiratory Volume in first second.
- MVV - Maximum Voluntary Ventilation.
- RR - Respiratory Rate.

Outcome measures are measured before and after the treatment.

4.13 PHOTOGRAPHICAL ILLUSTRATION

4.13.1(A) Flutter device

4.13.1(B) Flutter device

4.13.2 Diaphragmatic breathing exercise

4.13.3 Patient using flutter device

4.13.4 Patient using Spirometry

4.14 STATISTICAL ANALYSIS

Pre-test and Post-test values of the study will be collected and assessed for variation in improvement & their results will be analyzed using Independent `t' test and Paired `t' test.

- ✓ **INDEPENDENT `t' TEST (between groups)**

$$t = \frac{\overline{X1} - \overline{X2}}{S} \sqrt{\frac{n_1 n_2}{(n_1 + n_2)}}$$

Where,

$$S = \sqrt{\frac{\sum d_1^2 + \sum d_2^2}{n_1 + n_2 - 2}}$$

- ✓ **PAIRED `t' TEST (within groups)**

$$\mathbf{t} = \frac{\bar{d}\sqrt{n}}{S}$$

Where,

$$\mathbf{S} = \sqrt{\frac{\sum d^2 - \left[\bar{d}\right]^2 \times n}{n-1}}$$

- S=combined standard deviation
- d_1&d_2 =difference between initial & final readings in group A &group B respectively.
- n_1&n_2=number of patients in group A & group B respectively.
- $\overline{X_1}$&$\overline{X_2}$ =Mean of group A & group B respectively.
- Level of significance: 5%.

DATA PRESENTATION

5.DATA PRESENTATION

5.1. TABULAR PRESENTATION: PAIRED't' TEST

Table 5.1.1:Paired't' test values for Group A (Flutter &conventional physiotherapy)

S.No	Parameters	Pre-test	Post-test	Paired – 't' value	Table – 't' value
1.	Respiratory rate	8.7333	14.3333	17.461	2.145
2.	FEV1	1.6253	2.9260	7.853	
3.	MVV	67.7333	111.7333	10.052	

Table 5.1.2: Paired 't' test values for Group B(conventional physiotherapy)

S.No	Parameters	Pre-test	Post-test	Paired – 't' value	Table – 't' value
1.	Respiratory rate	8.5333	13.4	11.798	2.145
2.	FEV1	1.5673	2.5627	6.396	
3.	MVV	67.1333	93.8000	6.685	

5.2. TABULAR PRESENTATION: INDEPENDENT 't' TEST

Table 5.2.1: Independent 't' test values of Respiratory Rate for Group A and Group B

Mean Values	Group		Calculated 't' Value	Table 't' Value
	Group A	Group B		
Pre Test	8.7333	8.5333	0.584	2.048
Post Test	14.3333	13.4	2.709	

Table 5.2.2: Independent 't' test values of FEV1 for Group A and Group B

Mean Values	Group		Calculated 't' Value	Table 't' Value
	Group A	Group B		
Pre Test	1.6253	1.5673	0.356	2.048
Post Test	2.9260	2.5627	2.110	

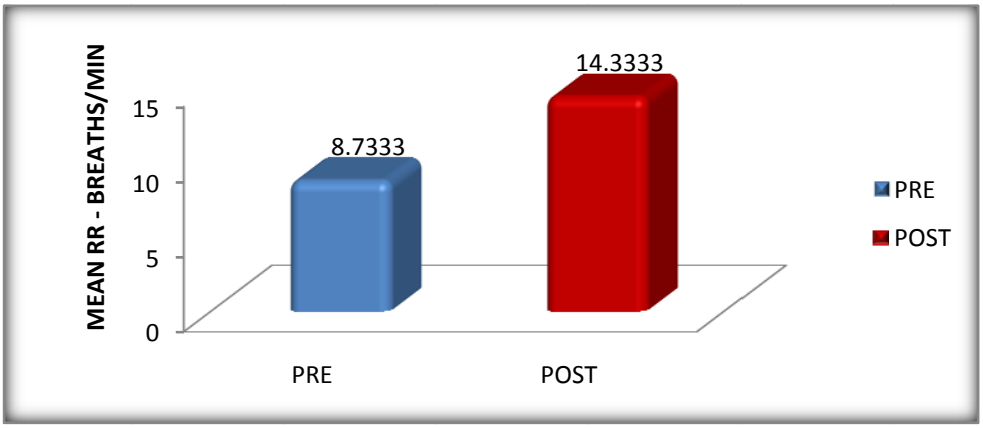
Table 5.2.3: Independent 't' test values of MVV for Group A and Group B

Mean Values	Group		Calculated 't' Value	Table 't' Value
	Group A	Group B		
Pre Test	67.7333	67.1333	0.136	2.048
Post Test	111.7333	93.8	3.408	

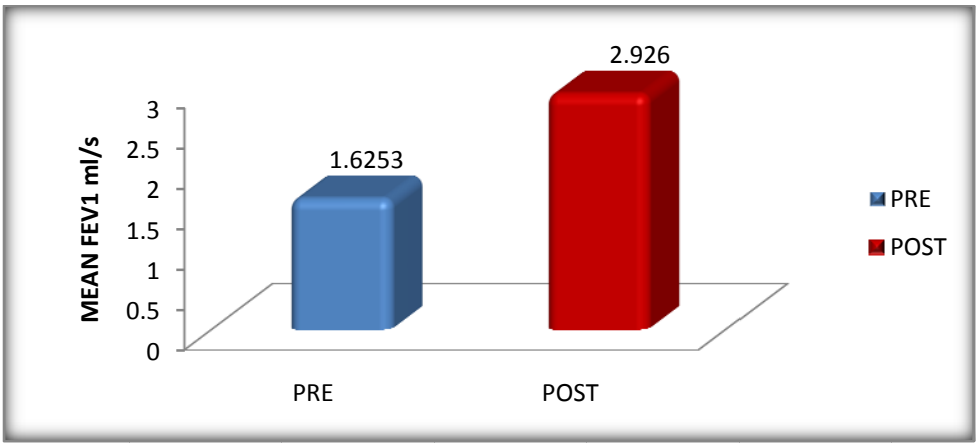
5.3 GRAPHICAL REPRESENTATION

PAIRED‘t’ TEST – Group A

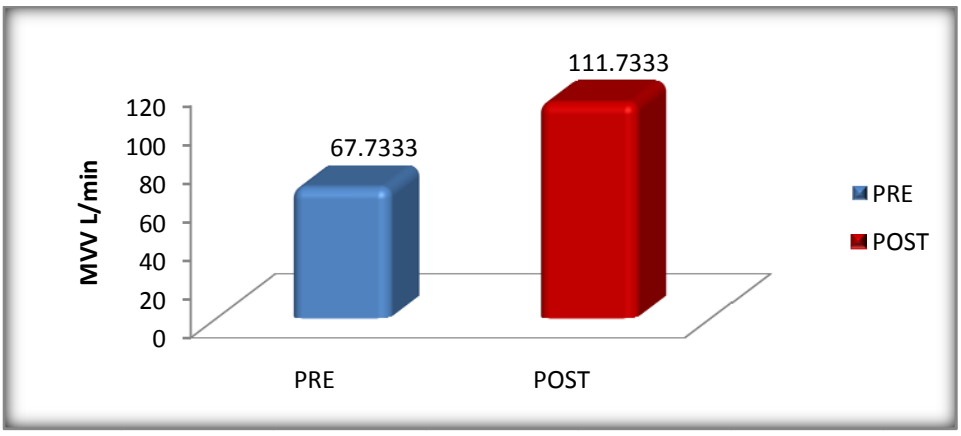
Graph 5.3.1: Pre and post mean values of Respiratory Rate for Group A



Graph 5.3.2: Pre and post mean values of FEV1 for Group A

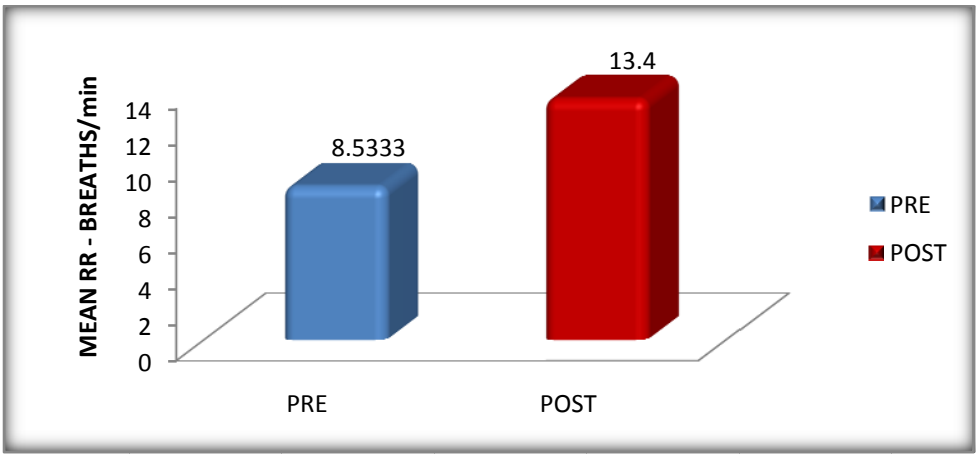


Graph 5.3.3: Pre and post mean values of MVV for Group A

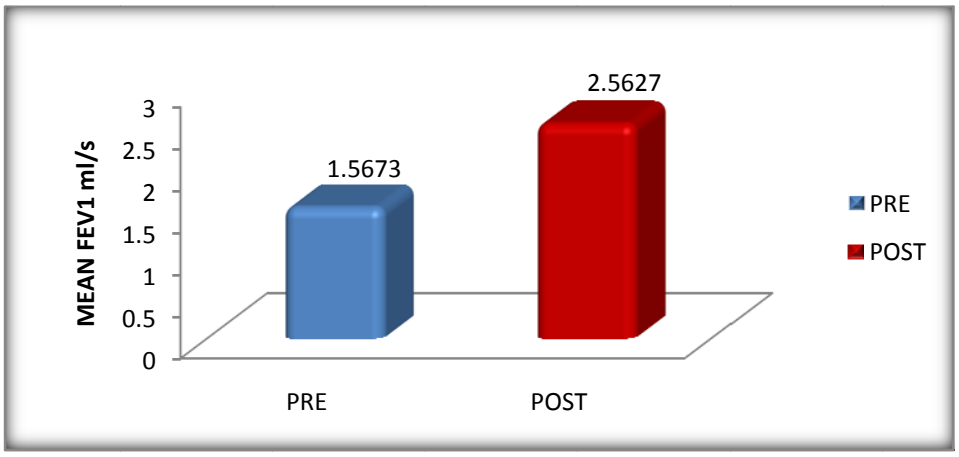


PAIRED‘t’ TEST – GROUP B

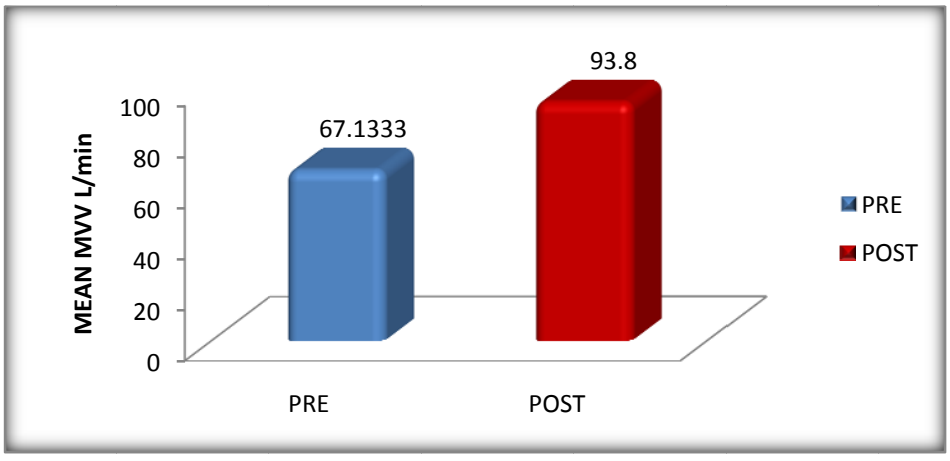
Graph 5.3.4: Pre and post mean values of Respiratory Rate for Group B



Graph 5.3.5: Pre and post mean values of FEV1 for Group B

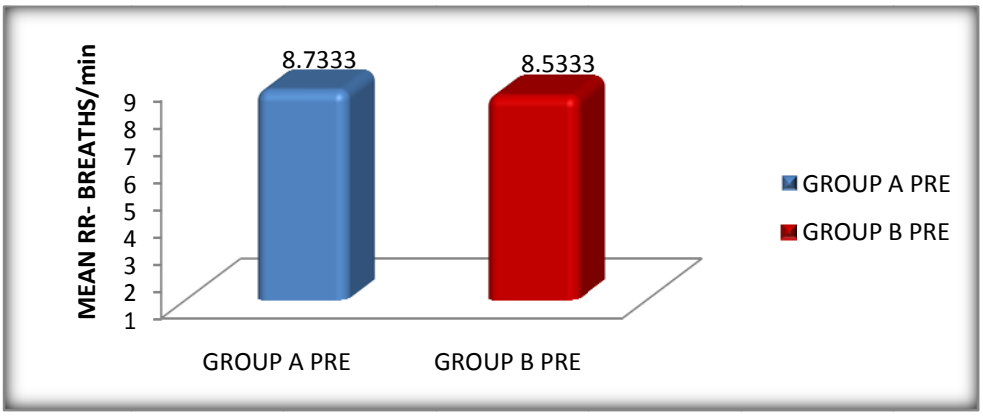


Graph 5.3.6: Pre and post mean values of MVV for Group B

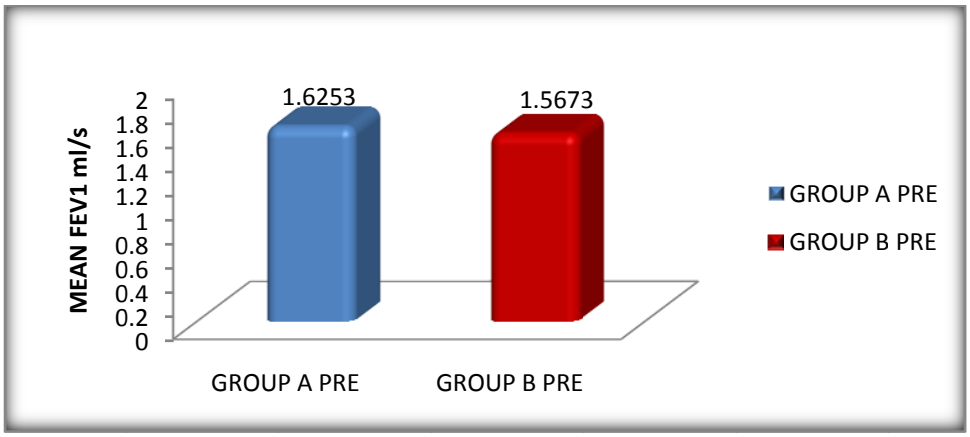


INDEPENDENT ‘t’ TEST FOR PRE TEST VALUES OF GROUP A AND GROUP B

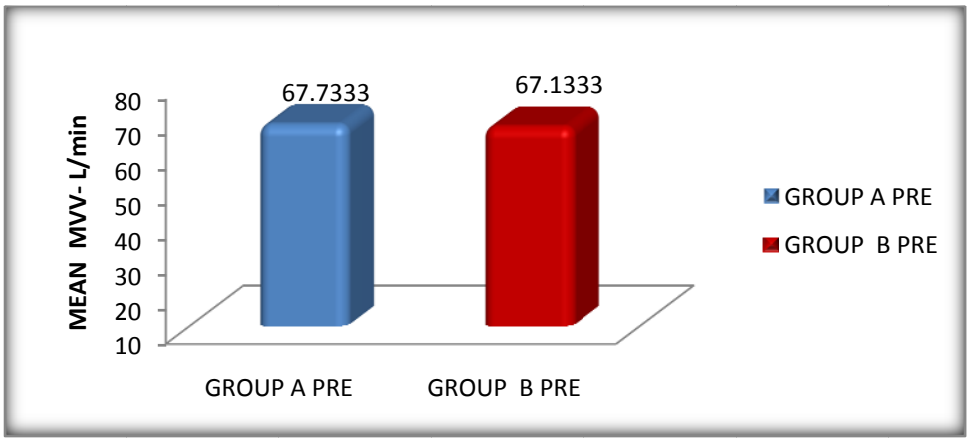
Graph 5.3.7: Pre test mean values of Respiratory Rate for Group A and Group B



Graph 5.3.8: Pre test mean values of FEV1 for Group A and Group B

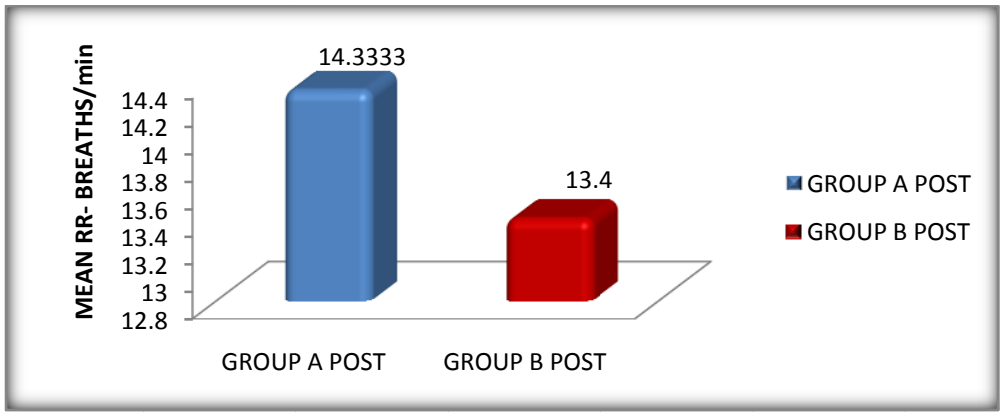


Graph 5.3.9: Pre test mean values of MVV for Group A and Group B

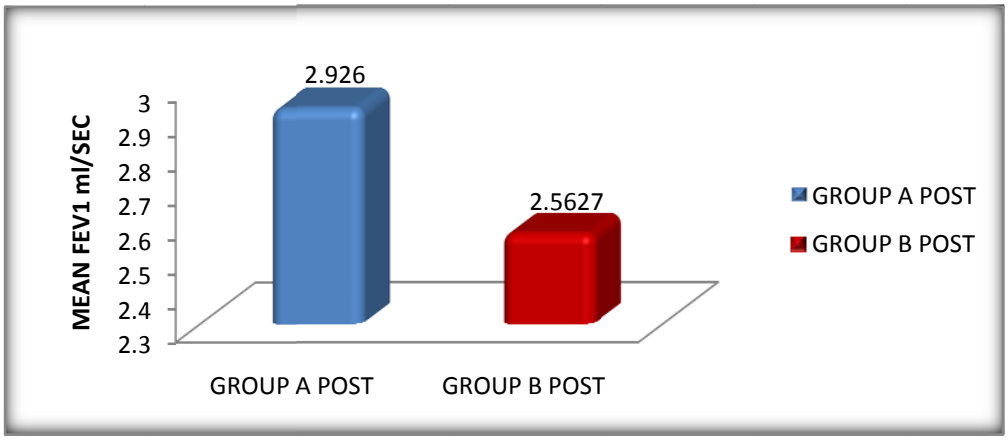


INDEPENDENT ‘t’ TEST –POST TEST OF GROUP A AND GROUP B

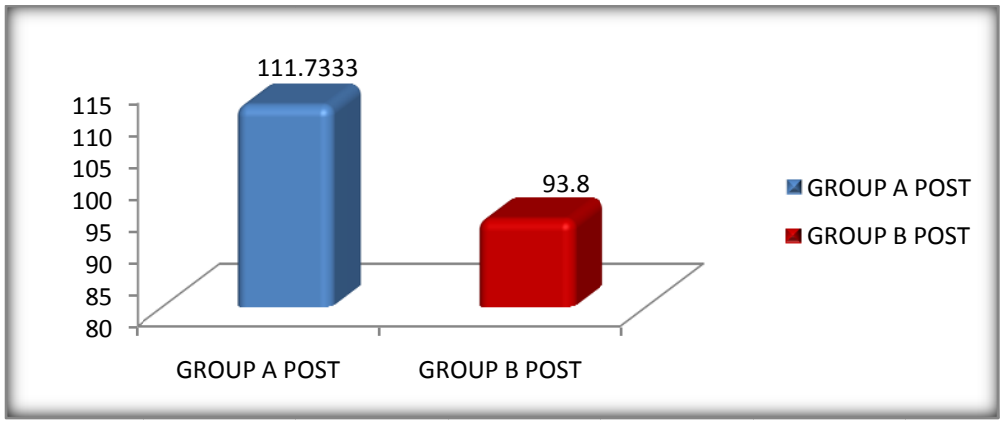
Graph 5.3.10: Post test mean values of Respiratory Rate for Group A and Group B



Graph 5.3.11: Post test mean values of FEV1 for Group A and Group B

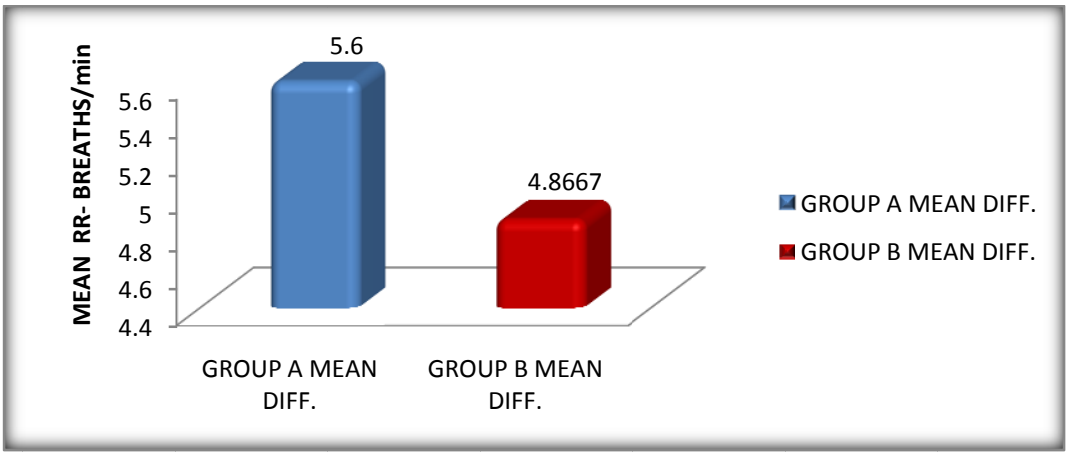


Graph 5.3.12: Post test mean values of MVV for Group A and Group B

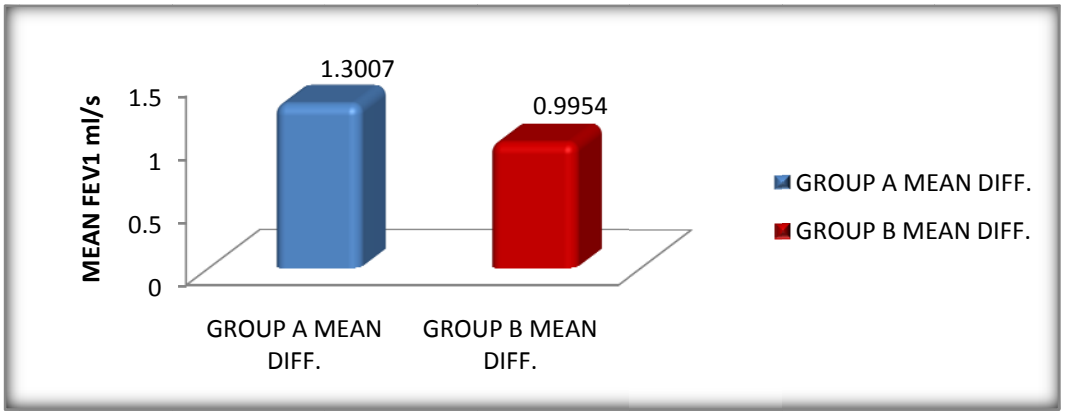


COMPARISON OF MEAN DIFFERENCE – GROUP A AND GROUP B

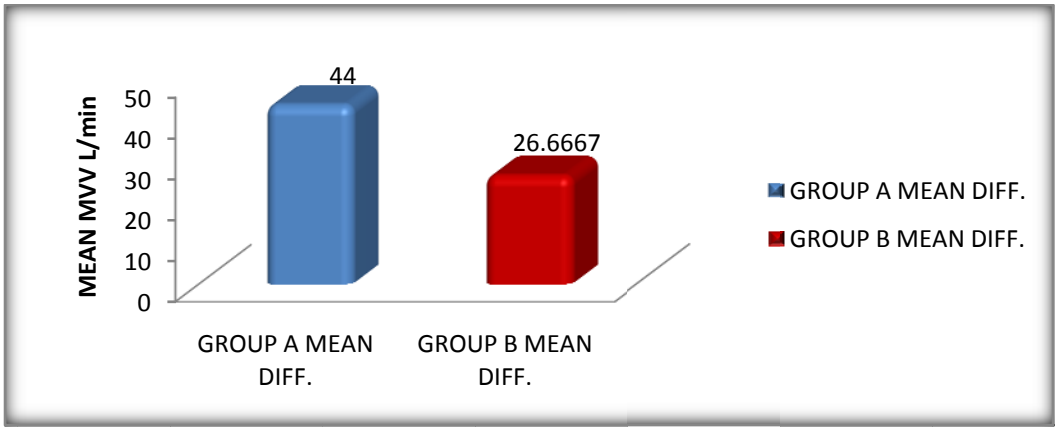
Graph 5.3.13:Comparison of mean differences of Respiratory Rate for Group A& Group B



Graph 5.3.14: Comparison of mean differences of FEV1 for Group A& Group B



Graph 5.3.15:Comparison of mean differences of MVV for Group A& Group B



DATA ANALYSIS & RESULTS

6. DATA ANALYSIS AND RESULTS

RESPIRATORY RATE: PAIRED‘t’ TEST

GROUP A: FLUTTER WITH CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of respiratory rate was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 17.461. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence there was significant effect of flutter with conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

GROUP B: CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of respiratory rate was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 11.789. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence, there was significant effect of conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

RESPIRATORY RATE: INDEPENDENT‘t’ TEST

PRE TEST VALUES: The pre test values of both the groups were analyzed using independent‘t’ test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value is 2.048 and the calculated ‘t’ value is 0.584. As the calculated‘t’ value was lesser than the table‘t’ value, there was no significant difference between the pre test values of both groups. Hence there was homogeneity between both the groups before the experiment.

POST TEST VALUES: The post test values of both the groups were analysed using independent‘t’ test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value is 2.048 and the calculated ‘t’ value is 2.709. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis rejected. Hence, there was significant difference between effect of flutter with conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

FEV1:PAIRED‘t’ TEST

GROUP A: FLUTTER WITH CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of FEVI was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 7.853. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence, there was significant effect of flutter with conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

GROUP B: CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of FEV1 was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 6.396. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence, there was significant effect of conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

FEV1:INDEPENDENT‘t’ TEST

PRE TEST VALUES: The pre test values of both the groups were analyzed using independent‘t’test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value 2.048 and the calculated ‘t’ value is 0.356. As the calculated‘t’ value was lesser than the table‘t’ value, there was no significant difference between the pre test values of both groups. Hence, there was homogeneity between both the groups before the experiment.

POST TEST VALUES: The post test values of both the groups were analyzed using independent‘t’test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value 2.048 and the calculated ‘t’ value is 2.11. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis is rejected. Hence, there was significant difference between effect of flutter with conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

MVV: PAIRED ‘t’ TEST

GROUP A: FLUTTER WITH CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of MVV was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 10.052. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence, there was significant effect of flutter with conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

GROUP B: CONVENTIONAL PHYSIOTHERAPY

The pre test and post test values of MVV was analyzed using paired‘t’ test. For 14 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.145 and the calculated ‘t’ value was 6.685. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis was rejected. Hence, there was significant effect of conventional therapy in improving respiratory rate in patients who underwent upper abdominal surgery.

MVV: INDEPENDENT‘t’ TEST

PRE TEST VALUES: The pre test values of both the groups were analyzed using independent‘t’ test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value is 2.048 and the calculated ‘t’ value is 0.136. As the calculated‘t’ value was lesser than the table‘t’ value, there was no significant difference between the pre test values of both groups. Hence, there was homogeneity between both the groups before the experiment.

POST TEST VALUES: The post test values of both the groups were analyzed using independent‘t’ test. For 28 degrees of freedom and 5% level of significance, the table‘t’ value 2.048 and the calculated ‘t’ value is 3.408. As the calculated‘t’ value was greater than the table‘t’ value, null hypothesis is rejected. Hence there was significant difference between effect of flutter with conventional therapy and conventional therapy alone in improving respiratory rate in patients who underwent upper abdominal surgery.

DISCUSSION

7. DISCUSSION

Abdominal surgeries are very common today. The post-operative abdominal complications include post-operative fever, atelactasis, wound infection, embolism and deep vein thrombosis. The highest incidence is between 1 and 5 days after the surgery. However, specific complications occur in the following distinct patterns: early postoperative, several days after the operation, throughout the postoperative period and in the late postoperative period. Basal Atelectasis: minor lung collapse and Pneumonia are the respiratory complications associated with abdominal surgery[47]. Cardio-pulmonary physical therapy aims to deal with these problems head on before the come in to the picture.

Maintenance of clear airways, removal of secretions expansion of alveoli are the main goals of cardio-pulmonary physical therapy there are many devices which are invented as adjunct to chest physiotherapy[24]. Flutter is one among them.

This study was conducted to find effect of flutter devices on pulmonary function in patients who underwent upper abdomen surgery.

In the present study 30 patients who underwent upper abdomen surgery are selected and divided in to two groups each group contains 15 patients. Group A receives flutter and conventional therapy and group B receive conventional physiotherapy. Computerized PFT is to record the outcome measures RR, FEV1 and MVV.

Statistical analysis was done using paired‘t’ test and independent‘t’ test.

Paired‘t’ test analysis showed that there was the statistically significant change within both the groups. Group A showed significant improvement in RR, FEV1 and MVV.

The improvement could be due to the usage of the flutter devices. Since, flutter is a mucous clearance device it has the ability to vibrate the airway (which loosen mucous from airway walls), intermittently increase endobronchial pressure (which helps maintain the patency of the airways during exhalation so that mucus does not become trapped as it moves up the airways) and accelerate expiratory airflow (which facilitates the upward movement of mucus through the airways so that it can be more easily cleared) [24, 46].

The Flutter provides positive expiratory pressure (PEP) therapy for patients who have Chronic Obstructive Pulmonary Disease (COPD) such as Asthma, Bronchitis, Cystic Fibrosis, Atelectasis, or other conditions producing retained secretions including post operative patients who retains secretions due to the effect of anesthesia. PEP therapy, combined with forced expiratory technique (FET), or "huff" coughing, may be used for airway clearance, bronchial hygiene, or as an alternative to conventional chest physiotherapy (CPT) and pursed lip breathing. PEP therapy will help prevent accumulation of secretions; improve mobilization of secretions; promote effective breathing patterns and improve gas exchange and distribution of ventilation; improve central and peripheral airway function; prevent or reverse Atelectasis[24, 26].

Studies have shown that the positive expiratory pressure is very effective in mobilizing secretions. **Maggie McIlwaine et al[29]., J. Orman et al**[32].

The pre test and post test values of both experimental group and control group showed significant improvement in respiratory rate, FEV1, and MVV. But, experimental group showed more significant improvement than control group in removal of secretion and in lung parameters. The small size sample and duration of the treatment is not enough for the detection of treatment effect. The implications of the findings in this study are important and should be confirmed in large sample size.

SUMMARY & CONCLUSION

8. SUMMARY AND CONCLUSION

This study was to find out the effect of flutter with conventional therapy and conventional therapy alone in improving the RR, FEV1 and MVV in patients who underwent upper abdominal surgery. Thirty patients who underwent upper abdominal surgeries were selected based on the inclusion criteria and allotted to two groups by simple random sampling method and fifteen of them were treated with flutter and conventional therapy. The rest of the fifteen were treated with conventional therapy alone. Respiratory rate was assessed by observation while FEV1 and MVV were measured by spirometry. The data was analyzed by using‘t’test and results showed that both experimental group and control group elicited improvement in RR, FEV1 and MVV. But, experimental group has significant improvement when compared to conventional group. Hence, it is concluded that adding flutter with conventional have additional benefits of improving clearance of secretion and pulmonary functions.

LIMITATIONS & SUGGESTIONS

9. LIMITATIONS AND SUGGESTIONS

1. This study has been done with smaller number of subjects. Study with a large population is recommended.

2. The study was a short term study, therefore long term study is recommended.

3. Incidence of post operative pulmonary complications and length of hospital stay are not studied.

4. Further studies using combinations of airway clearance technique along with flutter, with varying duration and position can be done to obtain maximum therapeutically output.

5. This only deals with objective measurement. A study which also deals with subjective measures such as dyspnea is recommended.

6. Measurement tools of this study to measure pulmonary function were computerized pulmonary function tests [RR, FEV1 and MMV]. Other measurements criteria like PEFR, arterial oxygen saturation, respiratory rate and sputum volume can also be included.

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10. BIBLIOGRAPHY

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APPENDICES

APPENDIX-I

INFORMED CONSENT TO PARTICIPATE IN THE RESEARCH STUDY

I _____ voluntarily consent to participate in the research study

“EFFECT OF FLUTTER DEVICE WITH CONVENTIONAL PHYSIOTHERAPY AND CONVENTIONAL PHYSIOTHERAPY ALONE ON PULMONARY FUNCTION IN PATIENTS WHO UNDERWENT UPPER ABDOMINAL SURGERY’’

-A comparative study

The researcher has explained to me about the exercise approach in brief, the risk of participation and has answered the questions related to the research to my satisfaction

Signature of the applicant: **Signature of the researcher:**

Signature of the witness:

APPENDIX-II

ASSESSMENT FORM

Patient profile:

Name:

Age:

Sex:

Occupation:

Address:

Chief complains:

Does he \she have

Hemodynamic stability: yes / no.

Haemoptysis: yes / no.

Co-operative: yes / no.

Pnemothorax: yes / no.

History:

Surgical history:

Side:

Site:

Mode:

On observation:

On palpation:

On examination:

Computerized pulmonary function test is used to find the ,

S. no	Parameters	Pre-test	Post-test
1.	Respiratory rate		
2.	Forced expiratory volume in first second.		
3.	Maximum voluntary ventilation		